

APPLYING KINEMATIC EQUATIONS TO BODIES UNDER FREE-FALL CONDITIONS

1. A student drops a rock from a bridge to the water 12 m below.
 - a) How many seconds does it take the rock to hit the water?
 - b) How fast is the rock moving when it hits the water?
2. A weather balloon is floating at a certain height above the earth when it releases a heavy pack of instruments.
 - a) If the pack hits the ground with a speed of 73 m/s, how far up is the balloon when it is released?
 - b) How long does it take the instrument pack to reach the ground?
3. An engineer must design a runway that allows planes to reach a ground speed of 61 m/s before they can take off. If the planes accelerate at 2.4 m/s^2 , what must be the minimum length of the runway?
4. A rock is thrown straight down, not dropped, from the roof of a building that is 61 m above the ground. If it takes 3.1 s to reach the ground, with what speed was it thrown?
5. A baseball is hit straight up into the air with a speed of 33 m/s.
 - a) How high does it go?
 - b) How long is it in the air? That is, what is its total time of flight?
6. An astronaut drops a feather from 1.25 m above the surface of the moon. There is no atmosphere on the moon. The acceleration due to gravity on the moon is 1.62 m/s^2 .
 - a) How long does it take the feather to hit the ground?
 - b) How long would it take a hammer to fall the same distance?
7. A tennis ball is dropped 1.2 m above the ground. With what velocity does it hit the ground (before the ground stops it)?
8. Inneedabreak throws a baseball vertically upwards, and 2.8 seconds later catches it at the same level. Determine the velocity with which the ball left her hand.